

A NEW MYXOSPORIDIAN (SPOROZOA) INFECTING THE SPANISH MACKEREL¹

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ABSTRACT

A description is given of a new species of myxosporidian parasite located in the musculature of the Spanish mackerel (*Scomberomorus maculatus*) from southern Florida. The name *Kudoa crumena* sp. n. is suggested for this parasite. The polysporous cysts are ellipsoidal and contain spores which measure 9.9 μ in breadth, 7.5 μ in length, and 9.0 μ in thickness when preserved.

In the course of examination of the Spanish mackerel, *Scomberomorus maculatus*, one of the common pelagic fishes of south Florida, a myxosporidian was discovered which is thought to be a new species.

It is a pleasure to acknowledge the assistance of Dr. Paul A. Meglitsch, Biology Department, Drake University, who read the manuscript of this paper. Mr. W. M. Stephens, Institute of Marine Science, University of Miami, kindly made the photograph of the encysted parasite and Mr. Ramon J. Garcia prepared the drawings of the spores.

Kudoa crumena, sp. n.

Figs. 1, 2

Material.—Only a single Spanish mackerel infected with a species of *Kudoa* was obtained for study. This fish was caught in the commercial fishery near Miami, Florida, and was preserved in 10 per cent formalin. This myxosporidian is herein described.

Average measurements of spores are given here (when the data are available) followed by the ranges in parentheses. Material is deposited in U. S. National Museum, Cat. No. 23748.

Location in the host.—Numerous typical histozoic myxosporidian cysts were present throughout the musculature (Fig. 1). Cysts were located within connective tissue surrounding muscle fibers, with the greater diameter parallel to the long axis of muscle fibers.

Diagnosis.—The cysts, which measured 1.2 (0.8-1.7) by 1.9 (1.1-2.6) mm (based on 10 measurements) were polysporous, whitish, ellipsoidal bodies.

Mature spores were 9.9 (9.3-10.4) μ in breadth, 7.5 (6.8-8.2) μ in length and 9.0 (8.2-9.7) μ in thickness. Four polar capsules located at the anterior end of the spore were of approximately uniform size, being

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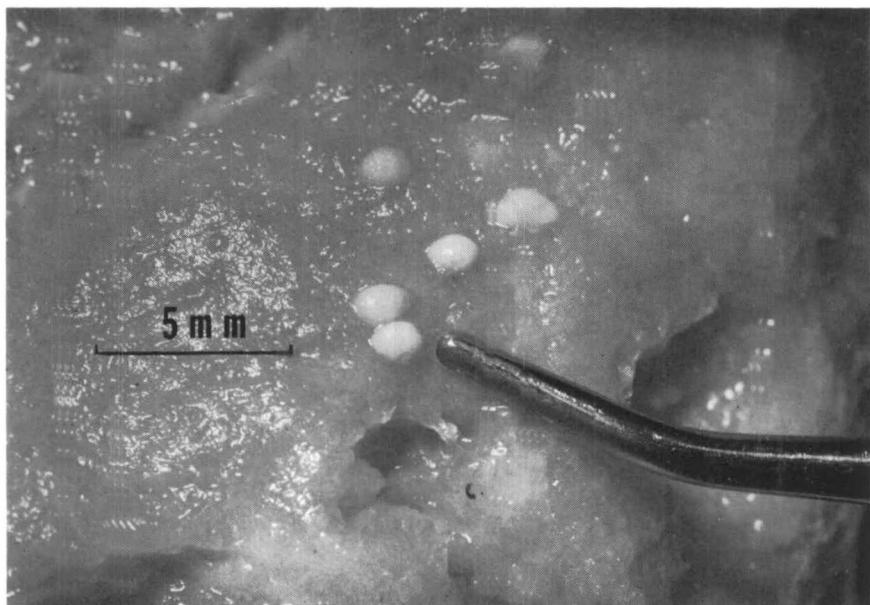


FIGURE 1. Cysts of *Kudoa crumena* sp. n. in musculature of Spanish mackerel.

4.0 (3.2-4.6) μ in length by 2.5 (2.1-2.9) μ in breadth, as shown by 10 measurements (Fig. 2). Ten extruded polar filaments were noted which were 15.5 (11.5-23.0) μ in length and were apparently uniform in diameter. Several windings of the polar filaments were occasionally discernible in the polar capsules. Sutural lines were distinct. No striations, ridges or markings were apparent on the spore wall. The spore was pouch-shaped with a truncated neck (Fig. 2). Some atypical spores were observed which, although similar in size and shape to normal spores, possessed from five to eight valves each with a polar capsule.

Comparisons.—Meglitsch (1947) removed eight myxosporidian species from the genus *Chloromyxum* and placed them in a new genus, *Kudoa*, which he created. Members of this genus are typically histozoic parasites in the skeletal muscles of fish and produce spores which are broader than long with four polar capsules.

To demonstrate the difference in spore shapes between *Kudoa* and *Chloromyxum*, Meglitsch (1947) plotted the relationship of spore breadth to spore length. Points on the graph representing *Chloromyxum* fell above an $x = y$ line (spore spherical) showing that this genus tends to be longer than broad. On the other hand, most of the points representing *Kudoa* fell below the $x = y$ line. A line fitted to these points (presumably by eye)

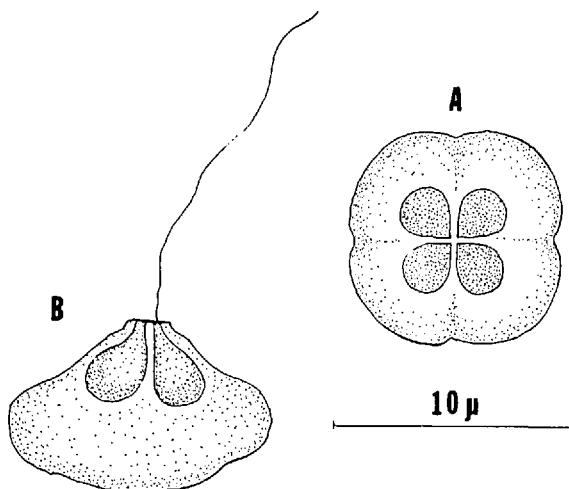


FIGURE 2. *Kudoa crumena* sp. n. Spores: A, Anterior view; B, Side view.

showed that *Kudoa* spores are broader than long. A plot of the point representing *Kudoa crumena* on his graph (his Figure 8, page 275) falls very close to the "Kudoa line" and well below the $x = y$ line.

The valves of some species of *Kudoa* are stellate in anterior view and, hence, are obviously different from the rounded valves we noted. Of those species of *Kudoa* with rounded valves, *K. crumena* is larger in nearly all dimensions than other members of this genus (Table 1). None of the species so far described has a definite truncated "neck" with the gradual bulging of the posterior end of the spore as noted in *K. crumena*. In all others the anterior end of the spore case is pointed. Because of the differences between the species *Kudoa* in the Spanish mackerel and published descriptions of other *Kudoa*, we believe the species is undescribed. We suggest the name *Kudoa crumena*. The specific name is proposed because of the spore shape, which is reminiscent of a small money pouch.

This myxosporidian adds to the list of histozoic species of this order present in marine fish. Meglitsch (1952) noted that the proportion of histozoic myxosporidians is lower in marine fish than coelozoic species.

The intensity of infection of the Spanish mackerel examined was high. It was difficult to estimate the total number of cysts present, but there were well over 100. Meglitsch (1947) found only three and five cysts of *K. clupeidae* in each of two large (25 cm long) menhaden he examined.

Reliable figures for the incidence of this disease in Spanish mackerel are not available in the south Florida area. Eight Spanish mackerel of both

sexes, measuring between 41 and 51 cm (fork length) were examined during the period from December 1963 to February 1965; these were apparently uninfected with this disease. Most mackerel are sold gutted, but not filleted. Interviews with fish producers suggested that the incidence of the infection is very low.

A few fillets of the king mackerel (*Scomberomorus cavalla*) were also examined because this species is closely related to the Spanish mackerel and is caught in the same waters. No myxosporidian cysts were found in the musculature of these fish.

While it is not known if *K. crumena* is a normal parasite of the Spanish mackerel, it is nonetheless interesting to speculate on the manner of transmission from one Spanish mackerel to another. Histozoic myxosporidians found in the epithelium or near the body surface of fish in enlarged cysts may rupture and release a cloud of spores. If this occurs in the vicinity of many individuals of the same species it can consequently infect many of them. On the other hand, histozoic Myxosporidia deep in the skeletal muscles require death or serious injury to the host to release the spores. It would be advantageous to the parasite to have spores released in the vicinity of many susceptible individuals.

Kudoa crumena in the musculature of a Spanish mackerel could be passed on to other fish of the same species if cannibalism were common, but since these fish school by size it is doubtful that they are ordinarily cannibalistic. Further, since Spanish mackerel are pelagic it is difficult to imagine how any contact between a dead or dying fish and other susceptible individuals would normally be established. Perhaps Spanish mackerel are an accidental host to this parasite, which is occasionally ingested with food. But histozoic myxosporidians occur regularly in fish with similar habits, for example, *Hexacapsula neothunni* in the muscle of yellowfin tuna, *Neothunnus macropterus* (Arai & Matsumoto, 1953). Yellowfin tuna is also a pelagic host which schools by size, and is only infrequently cannibalistic (Reintjes & King, 1953) yet Arai & Matsumoto (1953) found "considerable numbers" of yellowfin tuna infected with this myxosporidian.

The occurrence of histozoic Myxosporidia in scomberid fishes suggests a considerable gap in our knowledge of the life histories of such parasites.

SUMARIO

UN NUEVO MYXOSPORIDIO (SPOROZOA) QUE INFECTA EL PEZ SERRUCHO (*Scomberomorus maculatus*)

Se da la descripción de una nueva especie de parásito myxosporidio encontrado en la musculatura del pez serrucho (*Scomberomorus maculatus*) del sur de la Florida. Se sugiere el nombre de *Kudoa crumena* sp. n. para este parásito. Los quistes polisporos son elipsoidales y contienen

esporos que miden 9.9 μ de ancho, 7.5 μ de largo y 9.0 μ de grueso cuando están preservados.

LITERATURE CITED

ARAI, Y. AND K. MATSUMOTO
1953. On a new Sporozoa, *Hexacapsula neothunni* gen. et sp. nov., from the muscle of yellowfin tuna, *Neothunnus macropterus*. Bull. Jap. Soc. Sci. Fish., 18(7): 1-6.

KUDO, R. R.
1920. Studies on Myxosporidia. A synopsis of genera and species of Myxosporidia. Illinois Biol. Monogr., 5: 1-265.

LINTON, E.
1901. Parasites of fishes of the Woods Hole region. Bull. U. S. Fish. Comm., 18: 407-492.

MATSUMOTO, K.
1954. On the two new Myxosporidia, *Chloromyxum musculoliquefaciens* sp. nov. and *Neochloromyxum cruciformum* gen. et sp. nov., from the jellied muscle of swordfish, *Xiphias gladius* Linné, and common Japanese sea-bass, *Lateolabrax japonicus* (Temminck et Schlegel). Bull. Jap. Soc. Sci. Fish., 200(6): 1-9.

MEGLITSCH, P. A.
1947. Studies on Myxosporidia from the Beaufort Region. II. Observations on *Kudoa clupeidae* (Hahn), gen. nov. J. Parasitol., 33(3): 271-277.
1948. On *Kudoa funduli* (Hahn). Trans. Amer. Microbiol. Soc., 67(3): 272-274.
1952. The myxosporidian fauna of some fresh water and marine fishes. Iowa Acad. of Sci., 59: 480-486.

NIGRELLI, R.
1946. Parasites and diseases of the ocean pout, *Macrozoarces americanus* (Bloch and Schneider). Bull. Bing. Oceanogr. Coll., 9: 187-221.

REINTJES, J. W. AND J. E. KING
1953. Food of yellowfin tuna in the central Pacific. U. S. Fish and Wildl. Serv. Fish. Bull., 54(81): 91-110.

TRIPATHI, YOGENDRA R.
1953. Studies on parasites of Indian fishes, I. Protozoa: Myxosporidia together with a check-list of parasitic Protozoa described from Indian fishes. Records of the Indian Museum, 50(1): 63-89.

TYZZER, E. E.
1900. Tumors and Sporozoa in fishes. J. Boston Soc. Med. Sci., 5: 62-68.